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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/758,368	01/15/2004	Simon C. Steely JR.	200313752-1	5294

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EXAMINER	
ROJAS, MIDYS	
ART UNIT	**PAPER NUMBER**
2185	

NOTIFICATION DATE	DELIVERY MODE
02/05/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/758,368	STEELY ET AL.	
	Examiner	Art Unit	
	MIDYS ROJAS	2185	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,10-13,16-24 and 26-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10-13,17-23 and 26-41* is/are rejected.

7)☒ Claim(s) *16 and 24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. In view of applicant's remarks, presented in the Appeal brief dated 10/29/2008, the examiner has decided to re-open prosecution of this application. The final rejection dated 6/16/2008 is being withdrawn and a new rejection of the claims is being presented in view of Steely, Jr. et al. (US 7380,107).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-8, 10-13, 17-23, and 26-41 are rejected under 35 U.S.C. 102(e) as being anticipated by Steely, Jr et al. (US 7,380,107)

Regarding Claim 1, Steely Jr. discloses a multi-processor system (shown in Figure 3) comprising:

an owner predictor control that provides an ownership update message corresponding to a block of data to at least one of a plurality of owner predictors in response to a change in an ownership state of the block of data (owner predictor periodically updated by owner predictor control, Col. 9, lines 39-49), the update message comprising an address tag associated with the block of data and an identification associated with an owner node of the block of data (entry written to the

owner predictor identifying the cache line and processors having valid cache copies, Col. 9, lines 45-49); and

wherein a given one of the plurality of owner predictors, associated with a processor, comprises a first component that predicts an owner node of the block of data by observing the pattern of instructions within the processor (predictor control observes every time more or more processors acquires a coherent cached copy of a cache line, Col. 9, lines 39-49) and a second component that stores ownership update messages provided from the owner predictor control (owner predictor stores the cache line's identification and owner information, Col. 9, lines 45-49).

Regarding Claim 2, Steely Jr. discloses the system of claim 1, wherein the owner predictor control provides an ownership update message when the block of data at the owner node transitions to one of a modified or exclusive state (predictor control observes every time more or more processors acquires a coherent [e.g. shared, modified, or exclusive] cached copy of a cache line and then provides an ownership update message, Col. 9, lines 39-49).

Regarding Claim 3, Steely Jr. discloses the system of claim 1, further comprising a requesting node that provides a first request for the block of data to a home node (in response to a cache miss, the request engine generated two requests, Col. 9, lines 23-25 wherein one of the requests is to the home node, see Col. 10, lines 11-25 and Col. 7, lines 53-58), the requesting node being operative to provide a second request for the

block of data to at least one predicted node in parallel with first request (in response to a cache miss, the request engine generated two requests, Col. 9, lines 23-25 wherein one of the requests is a speculative request to a set of processors provided by an owner predictor, Col. 9, lines 32-49), the at least one predicted node being selected by an associated one of the plurality of owner predictors.

Regarding Claim 4, Steely Jr. discloses the system wherein the requesting node receives a coherent copy of the block of data from at least one of the home node and the at least one predicted node (receiving a coherent cache line from one of the processors or as a response to the system source request, see Col. 10, lines 1-25), the requesting node consuming a first coherent copy of the block of data received (Col. 10, lines 26-47).

Regarding Claim 5, Steely Jr. discloses the system of claim 3, wherein a cached copy of the block of data exists at the owner node, the home node issuing a third request for the block of data to the owner node (the home node determines the owner of the cache lines requested from a home directory and forwards the request to the owner, Col. 7, lines 53-55).

Regarding Claim 6, Steely Jr. discloses the system of claim 5, wherein the system employs a directory-based cache coherency protocol, the home node further comprising a directory that maintains directory state information associated with the

block of data, the home node issuing the third request to the owner node based on the directory state information indicating that the owner node has an exclusive cached copy of the block of data (home node uses entries in a directory to determine which processor is the owner of the cache line, see Col. 7, lines 53-55).

Regarding Claim 7, Steely Jr. discloses the system of claim 5, wherein the owner node provides one of (i) a response to the home node and (ii) a response to the home node and to the requesting node, the owner node providing the response based on a state of the cached copy of the block of data at the owner node (the owner replies by providing a coherent fill of the requested cache line to the source processor, Col. 7, lines 57-63).

Regarding Claim 8, Steely Jr. discloses the system of claim 5, wherein the at least one predicted node comprises the owner node, the owner node having an exclusive cached copy of the block of data and providing a data response to the requesting node based on which of the second request and the third request arrives at the owner node first (in determining that the response from one of the predicted processors is a coherent cache line, the system is determining that one of those processors was the owner node, see Col. 10, lines 1-25).

Regarding Claim 10, Steely Jr. discloses the system of claim 1, wherein the second component stores the provided update messages according to a first-in-first-out (FIFO) arrangement (FIFO arrangement, see Col. 9, lines 48-49).

Regarding Claim 11, Steely Jr. discloses the system of claim 1, wherein the second component is operative to prioritize update messages according to a determination at the first component (wherein the prioritization is based on age as per the characteristics of a FIFO arrangement, Col. 9, lines 48-49).

Regarding Claim 12, Steely Jr. discloses the system of claim 1, wherein the processor employs the given owner predictor to determine a predicted owner for a given block of data, the given owner predictor selecting between accessing the first component and the second component according to the frequency in which ownership update messages associated with the block of data have been received from the owner predictor control (the operations of the owner predictor and the predictor control are dependent on the frequency in which a cache line changes ownership status since for operation, the ownership control observes the ownership status changes, see Col. 9, lines 40-49).

Regarding Claim 13, Steely Jr. discloses a multi-processor network comprising (Fig. 3):

a first processor (owner 186) that includes a cache having a plurality of cache lines associated with respective blocks of data (such as cache 204, shown in Fig. 5), one cache line in the cache of the first processor transitioning to an ownership state based on a response to a request provided by the first processor (Col. 7, lines 24-45);

a second processor that includes an associated owner predictor (source processor 182 with owner predictor 214 as in Fig. 5);

an owner predictor control that broadcasts an update message to respective owner predictors associated with each of a plurality of processors comprising the multi-processor network, including the owner predictor associated with the second processor, to identify ownership for the one cache line consistent with the one cache line transitioning to the ownership state (broadcasting an update message, Col. 9, lines 50-57).

Regarding Claim 17, Steely Jr. discloses the network of claim 13, the network further comprising a home node having a directory that includes directory state information associated with the plurality of cache lines (home node uses entries in a directory to determine which processor is the owner of the cache line, see Col. 7, lines 53-55), the directory state information being updated to reflect the one cache line transitioning to the ownership state, and the owner predictor control providing an update message in response to the updating of the directory state information (maintenance of the MAF directory, see Col. 8, lines 33-46).

Claim 18 is rejected using the same rationale as that of Claim 3.

Claim 19 is rejected using the same rationale as that of Claim 8.

Regarding Claim 20, Steely Jr. discloses the network of claim 17, further comprising an unordered network interconnect that enables communication of requests, responses, and update messages among at least the first processor, the second processor and the home node (interconnect 212 of Fig. 5).

Claim 21 is rejected using the same rationale as that of Claims 1-3.

Regarding Claim 22, Steely Jr. discloses the system of claim 21, wherein the at least one coherent copy of the block of data is returned to the requesting node as a response in a response channel, the response being provided by the at least one predicted node (in response to the speculative request, the processors search their caches and provide the data if it is available, see Col. 10, lines 1-10).

Claim 23 is rejected using the same rationale as that of Claim 5.

Claim 26 is rejected using the same rationale as that of Claim 8.

Regarding Claim 27, Steely Jr. discloses the system of claim 26, wherein the owner node provides a victim message to the home node (coherent signal, Col. 7, line 64 – Col. 8, line 17) and the data response to the requesting node in response to the third request arriving at the owner node prior to the second request (the owner replies by providing a coherent fill of the requested cache line to the source processor, Col. 7, lines 57-58), the home node providing a speculation acknowledgement to the requesting node in response to the victim message from the owner node (coherent signal provided to the requesting node).

Regarding Claim 28, Steely Jr. discloses the system of claim 26, wherein the owner node provides a victim message to the home node (coherent signal, Col. 7, line 64 – Col. 8, line 17) in response to the second request arriving at the owner node prior to the third request (the second request allows the predicted processor to provide the source processor with the requested cache line, see Col. 10, lines 1-10; however, the requester still uses the first request via the home node to validate the coherency of the data, see Col. 10, lines 11-47), the owner node also providing the data response to the requesting node in response to the second request from the requesting node.

Regarding Claim 29, Steely Jr. discloses the system of claim 21, wherein the at least one predicted node further comprises a target node having a cache that includes the data having one of an invalid state and a shared state (see Col. 7, lines 24-51), the at least one predicted node providing a miss response to the requesting node in

response to the second request, and the owner node providing a data response to the requesting node in response to the third request (in response to the speculative request, the predicted nodes provide the requested cache data if it is available to it, Col. 10, lines 1-10 wherein if the data is not available, a miss occurs).

Claim 30 is rejected using the same rationale as that of Claim 21.

Claim 31 is rejected using the same rationale as that of Claims 3-4.

Claim 32 is rejected using the same rationale as that of Claim 5.

Claim 33 is rejected using the same rationale as that of Claim 12.

Claim 34 is rejected using the same rationale as that of Claim 1.

Claim 35 is rejected using the same rationale as that of Claims 3-4.

Claim 36 is rejected using the same rationale as that of Claim 5.

Claims 37-38 are rejected using the same rationale as that of Claim 8.

Regarding Claim 39, Steely Jr. discloses the system of claim 1, wherein the owner predictor control is configured to discontinue providing the ownership update message corresponding to a given block of data based on at least one of (i) an available bandwidth in the system, or (ii) a frequency with which the given block of data changes ownership (since the ownership messages are representative of the frequency in which cache lines change ownership status, when changes in ownership status stop, then the ownership updates are discontinued, see Col. 9, lines 23-49).

Regarding Claim 40, Steely Jr. discloses the system of claim 1, wherein the owner predictor control is programmed to broadcast the ownership update message each of the plurality of owner predictors to indicate the change in the ownership state of the block of data (Col. 9, lines 50-60).

Claim 41 is rejected using the same rationale as that of Claim 39.

Allowable Subject Matter

4. Claims 16 and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims

Regarding Claim 16, the Prior Art of record does not teach nor suggest the network and owner predictor as claimed in combination with providing update messages to predict an owner based on the available bandwidth relative to a threshold value.

Regarding Claim 24, the Prior Art of record does not teach nor suggest the system and owner predictor as claimed in combination with the claimed forward and request channels.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MIDYS ROJAS whose telephone number is (571)272-4207. The examiner can normally be reached on M-TH 6:00am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sanjiv Shah can be reached on (571) 272-4098. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sanjiv Shah/

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Supervisory Patent Examiner, Art Unit 2185

Examiner
Art Unit 2185

MR